
Risk Factors of Hip Fracture Among Thai Female Patients

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Abstract

A case-control study on hip fracture among female patients, aged 50 years and over, were conducted from 1995 to 1996. A consecutive series of newly admitted female patients with hip fracture (n = 60) and 60 age-matched controls were recruited. Four independent risk factors of hip fracture were identified, including "type of principle occupation as sedentary or housework", "low number of pregnancies", "low serum albumin" and "low bone mass density at inter-trochanter of the femur". When all univariate factors except bone density variables were entered into a multiple logistic regression analysis, four independent factors were identified including "no intake of milk regularly", "low number of pregnancies", "thin body appearance", and "low serum calcium". The study confirms the role of calcium intake as a preventive measure of hip fracture. Women with low weight-bearing work and housewives should have regular weight-bearing exercise.

Key word : Hip Fracture, Women, Risk Factors, Thai, Bone Density

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Population ageing of Thailand and other developing countries is an inevitable phenomenon (1). The increasing number of elderly leads to a high prevalence of osteoporosis and a high incidence of

hip fractures particularly among menopausal women. Hip fracture is a disease causing a burden to the elderly if it is not treated properly. Operation with hip prosthetic replacement is the treatment of choice.

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The fracture is widely considered as a public health issue because of its high cost of management^(2,3). The prevention of hip fractures, which may decrease both its incidence and financial burden, is hereby a concern of the authors. Therefore, preventable risk factors of hip fractures must be clarified. However, a study of risk factors of hip fractures has not been studied among a Thai population. This study aimed to determine risk factors associated with hip fracture among female patients, aged 50 and over, who were consecutively admitted to King Chulalongkorn Memorial Hospital.

SUBJECTS AND METHOD

A case-controlled study was conducted from 1995 to 1996. A consecutive series of newly admitted female patients, aged 50 years and over, with hip fracture were recruited (n = 60). Patients who had pathological fractures, those whose fractures were caused by traffic accidents and those who had a history of previous hip fracture, were excluded. Within 7 days of case recruitment, age-matched female patients (\pm 3 years) without hip fracture who were newly admitted to the King Chulalongkorn Memorial Hospital were randomly selected as the controls. The total number of controls was 60.

The cases and controls were interviewed using a structured questionnaire on personal data, socio-economic data, history of menstruation, age at menarche and menopause, number of pregnancies and breast feeding babies (at least one month duration of breast feeding period), nutritional data on calcium intake (milk, bean curd, soy-bean milk), history of exercise, type of work (principle occupation), history of medication, co-morbidity, history of cigarette smoking, history of alcoholic consumption, history of coffee and tea intake, history of falls during the previous year, history of fractures, family history of hip fractures and handedness, modified Barthel ADL Index (BAI)⁽⁴⁾ and Chula ADL Index (CAI)⁽⁵⁾ prior to admission, Chula Mental Test (CMT)⁽⁶⁾ on admission, body appearance rated by an interviewer (obese, medium, thin), and hip-waist ratio. Blood chemistry data was collected, namely; haemoglobin, serum creatinine, serum calcium, serum phosphate, serum alkaline phosphatase, and serum albumin. Bone densities of the hip (non-fracture site) of the neck, trochanter, inter-trochanter, Ward's triangle and total bone density was measured with Dual Energy X-ray Absorptiometer (DEXA).

Univariate factors were determined with a chi-square test, a student *t*-test or a Mann Whitney U test wherever appropriate. ($p < 0.05$) Multivariate factors were determined by entering all univariate factors into a multiple logistic regression analysis. Odds ratio and its 95 per cent confident interval were computed⁽⁷⁾. SPSS-PC programme was used for statistical analysis.

RESULTS

Sixty cases and sixty age-matched controls were recruited. Their mean age (standard deviation) were 71.7 (7.6) and 71.2 (8.0) years respectively. There were more Chinese among the case group (18.3%) than the control group (6.7%). Their characteristics are shown in Table 1. Univariate factors of hip fractures comprised 8 history and physical examination data, 3 biochemistry data (serum calcium, serum phosphate and serum albumin) and bone densities of the hip. (Table 2)

Independent factors of hip fractures obtained from a multiple logistic regression model were "type of principal occupation as sedentary or housework", "low number of pregnancies", "low serum albumin", and "low bone mass density at the inter-trochanter of the femur". When all univariate factors, except bone densities, were entered into a multiple logistic regression analysis, four independent factors were identified including "not taking milk regularly", "low number of pregnancies", "thin body appearance", and "low serum calcium".

DISCUSSION

The result of the study shows that type of work but not exercise was found as an independent factor of hip fractures among female patients. In Thailand, exercise is not a common practice among women in this age group, which explains why there is no difference in prevalence between the cases and the controls. Sedentary work and housework produce less bone strain than work with high weight-bearing effects such as agricultural work and labour. The authors' finding supports the finding of Jaglal SB et al that "being employed for more than 20 years in job that requires heavy activity" reduces risks of hip fracture in post-menopausal women⁽⁸⁾. This suggests that people who have a job with a low weight-bearing effect should have regular weight-bearing exercise.

Low serum albumin, an independent risk factor of hip fracture, might be an indicator of a

Table 1. Characteristics (Socio-economical data) of patients with (cases) and without hip fractures (controls).

	Cases (n = 60)	%	Controls (n = 60)	%
Mean age (standard deviation) in years	71.7	7.6	71.2	8.0
Race				
Thai	49	81.7	56	93.3
Chinese	11	18.3	4	6.7
Marital status as widowed	35	58.3	25	41.7
Illiteracy	14	23.7	12	20.0
Principal occupation				
Sedentary work or housework	35	58.3	22	36.7
Agriculture, labor, vendper	25	41.7	38	63.3
Area of living during early life - urban area	44	73.3	43	71.7
Have no telephone	15	25	6	10
Monthly income - means (standard deviation) in Baht	2,102	4,504	3,929	12,281

Table 2. Univariate risk factors of hip fracture among subjects recruited in the study.

	Cases		Controls	
Type of principle occupation as sedentary or housework : n (%)*	34	(56.7)	21	(35)
Have no telephone : n (%)*	15	(25)	6	(10)
No regular intake of milk : n (%)*	47	(78.3)	37	(61.7)
Number of pregnancies : mean (SD)**	4.6	(3.3)	6.5	(3.3)
Number of breast feeding babies : mean (SD)**	3.5	(2.9)	5.2	(3.0)
Chula ADL index score : mean (SD)*	6.7	(2.3)	5.9	(2.1)
Chula Mental Test score : mean (SD)*	16.8	(2.7)	17.6	(2.8)
Body appearance : n (%)***				
Obese	6	(10.3)	24	(41.4)
Medium	31	(53.4)	24	(41.4)
Thin	21	(36.2)	10	(17.2)
Serum albumin (mg/dl) : mean (SD)***	3.6	(0.7)	4.3	(0.4)
Serum calcium (mg/dl) : mean (SD)***	8.7	(0.6)	9.3	(0.5)
Serum phosphate (mg/dl) : mean (SD)*	3.5	(0.9)	3.8	(0.7)
Bone mass density at neck of femur : mean (SD)***	0.5244	(0.10)	0.6022	(0.13)
Bone mass density at trochanter of femur : mean (SD)**	0.3979	(0.09)	0.4482	(0.11)
Bone mass density at inter-trochanter of femur : mean (SD)***	0.6826	(0.15)	0.8113	(0.16)
Bone mass density at Wards area of femur : mean (SD)*	0.3149	(0.15)	0.3766	(0.13)
Total bone mass density of hip : mean (SD)***	0.5801	(0.12)	0.6808	(0.14)

* p < 0.05

** p < 0.01

*** p < 0.001

low nutritional status or having chronic diseases that might affect calcium absorption and balance. Nutritional deficiencies might play a role in hip fracture pathogenesis(9-12).

The present study demonstrates a "low number of pregnancies" as an independent factor and supports a protective role of high parity for hip fracture(13). It opposes the finding of Fujiwara

et al that women with five or more children significantly increased the risk of hip fracture(14). High parity possibly increased calcium absorption during pregnancy and lactation. Moreover, a "low number of pregnancies" was probably an index of wealth, which conditioned these women to have lower physical activity (work or carrying babies) than those who had more children. Declining fertility and phy-

Table 3. Multivariate factors, odds ratio and 95 per cent confidence interval (95% CI) of hip fracture among female subjects.

All univariate factors were entered into a multiple logistic regression analysis.

Independent variables	Odds ratio	95% CI
1. Type of principle occupation as sedentary or housework	2.91	1.01 - 8.41
2. Low number of pregnancies	1.25	1.05 - 1.49
3. Low serum albumin	9.35	2.82 - 31.00
4. Low bone mass density at inter-trochanter of femur	1,155.28	31.06 - 42,971.83

All univariate factors except bone mass density variables were entered into a multiple logistic regression analysis.

Independent variables	Odds ratio	95% CI
1. No regular intake of milk	3.84	1.31 - 11.23
2. Low number of pregnancies	1.18	1.02 - 1.37
3. Thin body appearance	2.93	1.40 - 6.14
4. Low serum calcium	5.4	2.30 - 12.67

sical activity among women might relate to the increase in the rates of hip fracture in developing countries(15).

Since the measurement of bone density is available only in some hospitals or medical centers in Thailand, its value for determining high-risk women of hip fracture was inevitably limited. Moreover, underlying associated factors of low bone mass, which might be useful for public health measures, would be clarified in the model after excluding bone mass density from the logistic regression analysis. Therefore, the authors performed a logistic regression analysis by entering all univariate factors except bone mass density.

Four factors, including "history of milk intake", "number of pregnancies", "body appearance" and "serum calcium", were identified from a multiple logistic regression model when the bone density variables were excluded. The finding supported the role of milk and calcium intake on hip fracture prevention. Thin body appearance was also found as a risk factor as reported in other studies(9-11,14,16-18). Although body fat has a positive effect on bone

density and a risk of hip fracture, obesity is a major risk factor of many serious diseases such as coronary heart disease. Maintaining body weight in an appropriate range is wisely suggested. "a low number of pregnancies" is still in the logistic regression model but not the "type of principle occupation" and might support the hypothesis of the authors. The relationship between fertility and risk of hip fracture should be further studied.

In conclusion, the study confirmed the role of calcium intake as a preventive measure of hip fracture among women. Women with low weight-bearing work and housewives should have regular weight-bearing exercise. Maintaining body weight in an appropriate range to avoid the risk of hip fracture without increasing the risk of obesity-related morbidity is recommended.

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ปัจจัยเสี่ยงของกระดูกสะโพกหักในผู้ป่วยหญิงไทย

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ในระหว่างปี พ.ศ. 2538-2539 ได้ทำการวิจัยแบบ case-control study ของกระดูกสะโพกหักในผู้ป่วยหญิง อายุ 50 ปีขึ้นไปจำนวน 60 คน โดยทุกคนเป็นผู้ป่วยหญิงที่เกิดกระดูกสะโพกหักรายใหม่ที่เข้ารับการรักษาในโรงพยาบาล จุฬาลงกรณ์และใช้ผู้ป่วยกลุ่มควบคุมที่มีอายุใกล้เคียงกันจำนวน 60 คน (ไม่เกิน 3 ปี) ผลพบปัจจัยเสี่ยงอิสระของกระดูกสะโพกหัก 4 ชนิดคือ "อาชีพหลักที่เป็นประเภทงานเบา ๆ และการเป็นแม่บ้าน" "จำนวนการตั้งครรภ์ที่ต่ำ" "ระดับแอลบูมินในซีรัมต่ำ" และ "มวลกระดูกที่ตำแหน่ง inter-trochanteric ของกระดูกต้นขาต่ำ" แต่เมื่อทำการวิเคราะห์โดยไม่รวม "มวลกระดูก" ไว้ในการวิเคราะห์ multiple logistic regression พบปัจจัยอิสระ 4 ชนิดคือ "การไม่ดื่มนมสม่าเสมอ" "จำนวนการตั้งครรภ์ต่ำ" "รูปร่างผอมบาง" และ "ระดับแคลเซียมในซีรัมต่ำ" ผลการศึกษานี้สนับสนุนบทบาทการป้องกันกระดูกสะโพกหักของการรับประทานแคลเซียม สตรีที่มีการทำงานประเภทต้องรับน้ำหนักตัว (weight-bearing) ต่ำและที่เป็นแม่บ้านควรออกกำลังกายประเภทต้องรับน้ำหนักตัวสม่ำเสมอ

คำสำคัญ : กระดูกสะโพกหัก, หญิงไทย, ปัจจัยเสี่ยง, มวลกระดูก

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